

**UNIVERSITY OF CALABAR  
CALABAR – NIGERIA**

**DEPARTMENT OF PURE AND APPLIED  
CHEMISTRY**

**INFORMATION  
HAND BOOK 2019/2020**

**For B.Sc. Applied Chemistry  
Students**

**July 2020**

## TABLE OF CONTENTS

1.0	Staff List	-	-	-	-	-	3
2.0	Departments Philosophy, Specific Objectives	-	-	-	-	-	7
3.0	Research Focus	-	-	-	-	-	7
4.0	Academic Programmes	-	-	-	-	-	8
4.1	Degree Offered	-	-	-	-	-	8
4.2	Course Code and Numbering System	-	-	-	-	-	8
5.0	Academic Programme; B.Sc. Applied Chemistry-	-	-	-	-	-	8
5.1	Specifics Objectives of the Programme	-	-	-	-	-	8
5.2	Curriculum for B.Sc. Applied	-	-	-	-	-	9
5.3	Course Description for B.Sc. Applied Chemistry-	-	-	-	-	-	12
6.0	Academic Regulations	-	-	-	-	-	24
6.1	Admission Requirements	-	-	-	-	-	24
6.2	Course System	-	-	-	-	-	25
6.3	Registration	-	-	-	-	-	25
6.4	Conduct of Examination	-	-	-	-	-	26
6.5	Examination Misconduct	-	-	-	-	-	27
7.0	Examination Result	-	-	-	-	-	29
7.1	Grading System-	-	-	-	-	-	30
7.2	Supplementary	-	-	-	-	-	30
7.3	Grade Point Average	-	-	-	-	-	31
7.4	Probation and Withdrawal from Programme	-	-	-	-	-	32
7.5	Graduation Requirements	-	-	-	-	-	33
7.6	Remarking of Scripts	-	-	-	-	-	33
7.7	Suspension of Studies	-	-	-	-	-	33
7.8	Classification of Degree-	-	-	-	-	-	34
8.0	Departmental Responsibilities	-	-	-	-	-	34
8.0	Examination officer	-	-	-	-	-	34
8.1	Academic Adviser	-	-	-	-	-	34

**STAFF LIST**  
**DEPARTMENT OF PURE AND APPLIED CHEMISTRY**

**Academic Staff**

1	OSABOR, VICENT NDEM	PROFESSOR	HND (1989) PGD (1994 M.Sc. (1997 Ph.D. (2005)
2	OFFIONG, EFANGA OFFIONG	PROFESSOR	B.Sc. Hon. Chemistry (1984) Ph.D. Inorganic(1990)
3	ITA, BENEDICT ISERON	PROFESSOR	B.Sc. Hon. Chemistry (1989) M.Sc. Physical Chemistry(1994) Ph.D. (2000)
4	IKAMA, EDET UWAH	PROFESSOR	B.Sc. Hon. Chemistry (1977) M.Sc. Physical Chemistry (1987) Ph.D. Physical/Environmental Chemistry (2002)
5	AYI, AYAMA AYI	PROFESSOR	B.Sc. Hon. Chemistry (1995) Ph.D.(2002) inorganic chemistry
6	EKPO, BASSEY OFFIONG	PROFESSOR	B.Sc. Chemistry (1989) M.Sc. Inorganic Environmental Chemistry (1995) Ph.D. Inorganic Geochemistry (2007)
7	BASSEY, FRANCISCA IME	PROFESSOR	B.Sc.(1991) PGDM (1993) M.Sc. (1998), MBA (1996) Ph.D. (2005) Organic Chemistry
8	OKAFOR, PETER CHUKWUEMEKA	PROFESSOR	B.Sc. Hon. Chemistry (1995), M.Sc. (2000) Ph.D. (2005)
	INIAMA, GRACE EKPENYONG	PROFESSOR	B.Sc. ( 1986) Chemistry Education , M.Sc. (1994),Analytical Chemistry, Ph.D. (2009) Inorganic Chemistry
9	IKPI, MAGDALENE EDET	ASSO. PROFESSOR	B.Sc. (1996) M.Sc. (2001) Ph.D. (2006) Physical Chemistry
10	OKON EMMANUEL EKPENYONG-DUKE	LECTURER 1	B.Sc. ED Chemistry (1989) M.Sc. Inorganic Chemistry (2010) Ph.D. Inorganic Chemistry (2009)
11	OYO-ITA, INYANG OKON	LECTURER 1	B.Sc. Chemistry (2004) M.Sc. Inorganic Chemistry (2010) Ph.D. inorganic Chemistry (2015)
12	ENO, EDEDET AKPAN	SNR. LECTURER	B.Sc. (1990) M.Sc. (2001) Ph.D. (2010) Inorganic Chemistry
13	NEJI, AMBA PETER	SNR. LECTURER	B.Sc. (1980) M.Sc. (2002) Ph.D. (2009) Analytical Chemistry
14	AKPE, MICHAEL AKOMAYE	SNR. LECTURER	B.Sc. Applied Chemistry(2002) M.Sc. Analytical Chemistry (2010) PGDE(2012) Ph.D. Analytical Chemistry (2016)
15	UGI BENEDICT USHAKA	LECTURER I	B.Sc. Chemistry ( ) M.Sc. Analytical /Environmental Chemistry ( ) Ph.D. Physical Chemistry.( 2015)
16	INAH, BASSEY ENYI	LECTURER 11	B.Sc. Chemistry (2004) M.Sc. Inorganic Chemistry(2011) Ph.D. Inorganic Chemistry (2019)
17	IMMAAYKWA ALEXANDER IKEUBA	LECTURER 11	B.Sc. Chemistry (2009) M.Sc. Physical (2015) Ph.D. in material Science and Engineering (2019)
18	BASSEY, ANSA EYO	LECTURER 11	B. ENG.(1997) M.Sc. (2001) PGCE (2006)
19	BASSEY VICTORIA MFON	LECTURER 11	B.Sc. Chemistry (2008) M.Sc. Physical Chemistry (2012)
20	UMO, FEHNTOLA ETIM	LECTURER 11	B.Sc. Chemistry 2008 M.Sc. Organic Chemistry 2013
	ASOGWA FREDRICK CHIJOKE	LECTURER II	B.Sc. Chemistry (2007) M.Sc. ( 2012) Ph.D. (2017)
21	SHISHE, PROVIDENCE BETELWHOBE	ASSIST. LECTURER	B.Sc. Pure and Applied Chemistry (2013) M.Sc. Inorganic Chemistry (2018) Ph.D. in view.
22	AKAKURU, UDOCHUKWU UZIOMA	ASSIST. LECTURER	B.Sc. Chemistry (2008) M.Sc. Industrial chemistry (2012)
23	OGAR, JOSEPH OCHOCHOWONI	ASSIST. LECTURER	B.Sc. Chemistry (2010) M.Sc. in view
24	ODEY, JOSEPH OMANG	ASSIST. LECTURER	B.Sc. Textile Science and Technology (2012) M.Sc. Colour Chemistry (2021) Ph.D. in view
25	ONYEBUENYI, IZUBUNDU BROWN	ASSIST. LECTURER	B.Sc. Industrial Chemistry (2008) M.Sc. Environmental Chemistry (2015) Ph.D. in view
26	LOUIS, MUZONG HITLER	ASSIST. LECTURER	B.TECH Industrial Chemistry (2014) M.Sc. (2019)
27	OBONO OKAMA EBRI	ASSIST. LECTURER	B.Sc. Chemistry (2008) M.Sc. Physical Chemistry (2018)
28	UBUA, UNIMUYI PLACIDUS	ASSIST. LECTURER	B.Sc. Chemistry (2011) M.Sc. Analytical and Environmental Chemistry (2016) Ph.D. in view.
29	APEBENDE, GLORIA CHIOMA	ASSIST. LECTURER	B.Sc. Chemistry (2005) M.Sc. Inorganic Chemistry (2010)
30	EMMANUEL, ASU BISONG	ASSIST. LECTURER	B.Sc. Chemistry 2015 M.Sc. 2019

31	ANYAMA CHINYERE AYI	ASSIST. LECTURER	B.Sc. Chemistry (2002) PGD (2016) M.Sc. (2018) Ph.D. in view
32	UGBAJA, ANTHONY UDUAK	ASSIST. LECTURER	B.Sc. Chemistry (2000) PGD (2004)M.Sc. ( 2013) Ph.D. in view
33	EJIAKO, JOEL EJIKE	ASSIST. LECTURER	B.Sc. Chemistry (2008 ) M.Sc.(2019)
34	PATRICK-INEZI FAITH SATU	GRAD. ASSIST.	B. TECH Industrial Chemistry (2013 ) M.Sc. Industrial Chemistry
35	ANDREW, HYELAVALADA BITRUS	GRAD. ASSIST.	B.Sc. Chemistry (2012 ) M.Sc. n view
36	ENUDI, OBIEZE CHRISTIAN	GRAD. ASSIST.	B.Sc. Chemistry (2017)
37	AGWUPUYE, JOHN AKWAGIOBE	GRAD. ASSIST.	B.Sc. Chemistry (2016)
38	UTSU, PATRICK MATHIAS	GRAD. ASSIST.	B.Sc. Chemistry (2016) Diploma in information and communication Technology(2011) M.Sc. in view
39	ASHISHIE, GODWIN UNIMASHI	GRAD. ASSIST.	B.Sc. Chemistry (2015)
40	NWAOGU, UDOCHI FAVOUR	GRAD. ASSIST.	B.Sc. Chemistry (2012)

#### TECHNICAL STAFF

1	EFFIOM, EMMANUEL OKON	CHIEF TECHNOLOGIST	NIST-DIPLOMA (1996)
2	ITA, GLORY EKPO	SNR. TECHNOLOGIST	OND(2005) HND(2011) PGD in view
3	MADUKAIRO, OTUANWAN CHINEDUM	TECHNOLOGIST I	WAEC(2001) ND (2005) HND (2014) NSIT (2006)
4	NWANGWU, NNENNA ROSEMARY	TECHNOLOGIST II	B.Sc. Industrial Chemistry (2010) PGD in Education (2018)
5	UDIE, GODWIN LIBUE	TECHNOLOGIST II	HND Polymer Chemistry (2010 )
6	EKANEM, ESE LAWRENCE	TECHNOLOGIST II	B.Sc. Chemistry (2014)
7	INYANG, ATTAH PIUS	TECHNOLOGIST II	B.Sc. Chemistry (2012 )
8	UJOATU, IJEOMA	TECHNOLOGIST II	B.Sc. Chemistry (2012 )
9	ADUMA, MALACHI OHIERO	TECHNOLOGIST II	B.Sc. Chemistry (2009) Dip. Comp. (2018)
10	OBI, FRANCIS ADOLPHUS	TECHNOLOGIST II	B.Sc. Chemistry (2013 )
11	UDOKA, UBONG UMANA	TECHNOLOGIST II	B.Sc. Chemistry ( 2009) HND (2012)
12	CHUKWUZUBELUM, IBEMESI	TECHNOLOGIST II	B.Sc. Chemistry ( 2009) NSIT (2019)
13	ADEY, BEN MABEHN	TECHNOLOGIST II	B.Sc. Chemistry (2009)
14	EJE, PRINCE OWOICHE	TECHNOLOGIST II	B.Sc. Chemistry (2014)
15	UBI, WISDOM MARTIN	TECNOLOGIST II	B.Sc. Chemistry (2014 )
16	AGBA GABRIEL ADALIKWU	TECHNOLOGIST II	B.Sc. Chemical Sc.(Chemistry) (2017)
17	ABUKPAIN JACINTA UWAINNAKAM	TECHNOLOGIST11	B.Sc. Chemistry (2017)
18	IDIKU JOHN ODIHIGBLOWO	TECHNOLIST11	B.Ed. Chemistry (2013)
19	ORTESE SUSAN MMUMUN	TECHNOLIST11	B.Sc. Chemistry (2015) Dip. Comp. (2007)
20	NOAH, SUNDAY TITUS	SNR. LAB.SUPERVISOR	FSLC ( ) WAEC (2008)
21	EDET, FAITH BASSEY	SNR. LAB. ASSISTANCE	S.S.C.E. (2014) Diploma in Computer (2015 ) B.Sc. in view
22	EKPENYONG, PATRICK EFFA	SNR. LAB. ASST.	FSLC, SSCE (1997)
23	EDEMEKONG, PATIENCE INUESHI	SNR. LAB. ASST.	FSLC (1972) MDI (2012) NABTEB (2013)
24	ISONG, CHARLES ABRAHAM	HIGHER TEC.	B.Ed. (2007) TRC (2017)

ADMIN STAFF

1	UDOH, IKPE SAMPSON	CHIEF EX. OFFICER	NIST in Microbiology/Virology (1992) Diploma in Computer Sc. (1996) PGD EE ( 1995) M.Sc. IN Environmental Management (2003)
2	ESSIEN ESSIEN SAMSON	SNR. CONF. SECRETARY	HND Secretarial Studies (2010)
3	NTUKIDEM, MERCY MFON	SNR. CONF. SECRETARY	HND Secretarial Studies (2016)
4	ZINCHAK, MBETOBONG EMMANUEL	ASST. REGISTRAR	B.SC. (2007)
5	EVOGOR, KUFRE JOEL	ASST. REGISTRAR	B.SC. Business Admin. (2011)
6	ETEFIA, MAGARET ALEXANDER	SNR.DATA PROCESSING OFFICER I	B.Sc. Business Education ( ), Diploma in Computer()
7	OKOLI, THERESA OYA	HIGHER EXEC. DATA PRO. OFFICER	B.A (HON) History/International Studies (2006) Diploma in computer (2014)
8	AYADE, CORNELIUS AGINYE	HIGHER EXEC. OFFICER	B.SC. Business Admin. (2007)
9	ADUMA, ALICE AGBO	HIGHER EXEC. OFFICER	B.Sc. Political Science Education (2008) PGD in Education (2019) M.Sc. In view
10	KEKUNG, BENEDICT OFRE	HIGHER EXEC. OFFICER	B.A (HON) History/International Studies (2006) Certificate in Information Technology (2009)
11	ADIE, REGINA BESHINA	HIGHER EXEC. OFFICER	B.Sc.in Edu. Foundation (2015)
12	OGAR, PETER UGBADA	HIGHER EXEC. OFFICER	B.SC. Mass Communication (2009) Computer Education and Secretarial studies (2012)
13	EGBE, BLESSING NKANU	HIGHER EXEC. OFFICER	B.Sc. Business Education (2016) typist grade 2 certificate (2003) Diploma in Computer (2004)
14	IYENA, BELINDA EFEM	HIGHER EXEC. OFFICER	B.SC. Public admin (2010)
15	ODEY GRACE ALOW	ADMIN ASSISTANT	B.SC. Mass Communication (2016)
16	ASHIKEM, LIEPHUNIM	EXECUTIVE OFFICER	NCE (2009) TC2 (200)
17	BISONG, MONICA NJIJIE	SNR. CLERICAL OFFICER	SSCE
18	AKPAN MAGDALENE GEORGE	HEAD CLEANER/ MESSAGER	SSCE (1994) FSLC (
19	EKPENYOUNG GLORY AKPANDEM	HEAD CLEANER/ MESSAGER	DIP. in computer ( 2018) SSCE (2018) FSLC

## **2.0 THE DEPARTMENT'S, PHILOSOPHY, VISION AND MISSION**

### **Philosophy**

Engendering global competitiveness through development of deductive reasoning capacity for sustainable industrial and economic growth.

### **Main Objectives**

- i. Encourage academic excellence through teaching and research,
- ii. Provide a national and international forum for in-depth discussions on important scientific topics in areas of vital interest to staff and students of the Department, iii. Create an atmosphere for the cultivation of good academic interactions among lecturers and students based on integrity and respect.
- iv. Aspire to values which are based on the highest professional and academic standards in terms of learning and character development.

### **Specific objectives**

- i. To train students to acquire the chemical knowledge and skills necessary for industries and other production sectors of the economy, such as breweries, food processing and preservatives, petrochemicals, pharmaceuticals, water works, agriculture and petroleum.
- ii. To produce qualified man-power for industrial establishments within the catchment areas and for the nation at large.
- iii. Educate its own students as chemists capable of conducting research and development studies in chemical and related industries.
- iv. Produce graduates who will themselves become employers of labor, with an added-value chain to the nation's technological and economic development.

## **3.0 RESEARCH FOCUS**

The research being carried out by members of the Applied Chemistry group includes characterization and evaluation of non-fossil oils as raw materials for the preparation of biopolymers, alkyd resins, oil- and water-based surface coatings, adhesives and cosmetics. The group also conducts research in the areas of organic geochemistry, environmental chemistry, and kinetics of polymer reactions, polymer-solvent interactions and molecular weights determination for polycondensation polymers. The research areas of other units of the Department are available in the Information Handbook of the Department for B.Sc. Chemistry students.

## **4.0 ACADEMIC PROGRAMME**

### **4.1 DEGREE OFFERED**

The Department offers single honors degree in Applied Chemistry: B.Sc. (Hons.) Applied Chemistry.

### **4.2 COURSE CODE AND NUMBERING SYSTEM**

The course code comprises a set of alphabets (ACH) and numbers (three digits). The first digit denotes the year of study of the course, the second, the subject area, while the last digit represents an arbitrary number for the course with odd numbering for 1<sup>st</sup> semester courses and even numbering for 2<sup>nd</sup> semester courses. For instances where there are many courses in a subject area for a particular semester, both even and odd numbers are used. Subject groups are;

- |   |                       |
|---|-----------------------|
| 0 | Service course        |
| 1 | Inorganic             |
| 2 | Physical              |
| 3 | Organic               |
| 4 | Analytical            |
| 5 | Applied               |
| 6 | Practical             |
| 7 | Seminar               |
| 8 | Project               |
| 9 | Industrial Attachment |

## 5.0 ACADEMIC PROGRAMME; B.Sc. APPLIED CHEMISTRY

### 5.1 SPECIFIC OBJECTIVES OF THE PROGRAMME

- i. To train students to acquire the chemistry knowledge and techniques necessary for industries and other production sectors of the economy, such as breweries, food processing and preservation, petrochemicals, pharmaceutical, water works, agriculture, and petroleum.
- ii. Educate its own students as chemists capable of conducting research, and development studies in chemical and related industries.

### 5.2 CURRICULUM FOR B.Sc. APPLIED CHEMISTRY

#### YEAR 1

##### 1ST SEMESTER COURSES

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>CREDIT HOURS</b>
CHM 101/111	GENERAL CHEMISTRY I / FOUNDATION CHEMISTRY I	3
BIO 111	GENERAL BIOLOGY I	3
MTH 111	ALGEBRA AND TRIGONOMETRY	3
PHY101/180	INTRODUCTORY PHYSICS I	2
GSS 101	USE OF ENGLISH	2
GSS 131	HISTORY & PHILOSOPHY OF SCIENCE	2
		15CH

##### 2ND SEMESTER COURSES

<b>COURSES CODE</b>	<b>COURSE TITLE</b>	<b>CREDIT HOURS</b>
CHM 102	GENERAL CHEMISTRY II /FOUNDATION CHEMISTRY II	3
BIO 112	GENERAL BIOLOGY II	3
MTH 132	COORDINATE GEOMETRY & CALCULUS	3
PHY102/181	INTRODUCTORY PHYSICS II	2
GSS 102	USE OF ENGLISH II	2
GSS 112	CITIZENSHIP EDUCATION	2
GSS 122	PHILOSOPHY & LOGIC II	2

#### YEAR 2

17CH

##### 1ST SEMESTER

<b>COURSES CODE</b>	<b>COURSE TITLE</b>	<b>CREDIT HOURS</b>
ACH 201	INTRODUCTION TO INDUSTRIAL CHEMISTRY	2
ACH 211	CHEMICAL TRANSPORT PROCESSES	2
CHM 211	INORGANIC CHEMISTRY I	2
CHM 221	PHYSICAL CHEMISTRY I	2
CHM 241	ANALYTICAL CHEMISTRY I	2
PHY 201/281	GENERAL PHYSICS I	2
MTH 211	LINEAR ALGEBRA	2
MTH 235	CALCULUS	2
GSS 211	COMPUTER PROGRAMMING I	2
		18 CH

##### 2<sup>ND</sup> SEMESTER

<b>COURSES CODE</b>	<b>COURSE TITLE</b>	<b>CREDIT HOURS</b>
ACH 212	MATERIAL, ENERGY AND HEAT TRANSFER PROCESSES	2
CHM 212	ORGANIC CHEMISTRY II	2
CHM 232	ORGANIC CHEMISTRY III	2
CHM 242	ANALYTICAL CHEMISTRY II	2
PHY 202	GENERAL PHYSICS III	2

MTH 104	STATISTICS FOR SCIENCE	2
MTH 212	NUMERICAL ANALYSIS	2
GSS 212	COMPUTER PROGRAMMING II	2
		18 CH
	TOTAL CREDIT HOURS AT 200 LEVEL	36 CH

### YEAR 3

#### 1 SEMESTER COMPULSORY COURSES

COURSE CODE	COURSE TITLE	CREDIT HOURS
ACH 313	SEPARATION METHODS & PROCESSES	2
ACH 315	PETROCHEMICAL INTERMEDIATES	2
ACH 317	PETROCHEMISTRY & GEOCHEMISTRY	2
ACH 319	KINETICS & INDUSTRIAL CATALYSIS	2
ACH 321	INDUSTRIAL METALLURGY	2
ACH 315	POLYMER SCIENCE & TECHNOLOGY	2
ACH 359	INDUSTRIAL CHEMICAL PROCESSES I	2
CHM 313	INORGANIC CHEMISTRY II	2
GSS 301	ENTREPRENEURSHIP EDUCATION I	2
	ELECTIVE	4 – 6 CH
		22 – 24 CH

#### 1<sup>ST</sup> SEMESTER ELECTIVE COURSES

Select at least one (1) course from the list

COURSE CODE	COURSE TITLE	CREDIT HOURS
ACH 353	COLOUR CHEMISTRY & TECHNOLOGY I	2
ACH 357	CARBOHYDRATE CHEMISTRY & TECHNOLOGY	2
CHM 311	RADIO AND NUCLEAR CHEMISTRY	2
CHM 331	FOOD CHEMISTRY	2
CHM 315	NON-AQUEOUS SOLVENTS	2

#### 2<sup>ND</sup> SEMESTER COMPULSORY COURSES

CHM 390	INDUSTRIAL ATTACHMENT	3
---------	-----------------------	---

### YEAR 4

1 <sup>ST</sup> SEMESTER	COMPULSORY COURSES	CREDIT HOURS
ACH 400	PRACTICAL APPLIED CHEMISTRY	2
ACH 414	PROCESS CONTROL & DEVELOPMENT	2
ACH 416	ENVIRONMENTAL CHEMISTRY	2
ACH 422	SOAPS, DETERGENT & COSMETICS	2
ACH 425	AGRICULTURAL & INORGANIC COMMODITY CHEMICALS	2
CHM 431	ORGANIC CHEMISTRY IV	2
CHM 433	APPLIED SPECTROSCOPY	2
CHM 441	INSTRUMENTAL METHODS OF ANALYSIS	2
CHM 470	SEMINAR	1
CHM 480	PROJECT	3
	ELECTIVES	2-4 CH
		20-21 CH

#### 1<sup>ST</sup> SEMESTER ELECTIVE COURSES

Select at least one (1) from the list		
ACH 457	APPLIED SURFACE AND COLLOID CHEMISTRY	2
CHM 417	ORGANOMETALLIC CHEMISTRY I	2
2 <sup>ND</sup> SEMESTER COMPULSORY COURSES		
ACH 413	INDUSTRIAL CHEMICAL THERMODYNAMICS	2
ACH 424	PHARMACEUTICALS & SPECIALTY CHEMICALS	2
ACH 451	POLYMER SCIENCE & TECHNOLOGY II	2



ACH 454	POLYMER SCIENCE & TECHNOLOGY III	2
ACH 455	FATS, OILS, LUBRICANTS & GREASES	2
CHM 442	ANALYTICAL CHEMISTRY III	2
CHM 480	PROJECT	2
GSS 302	ENTREPRENEURSHIP EDUCATION II	2
MSS 242	PRODUCTION MANAGEMENT	2
	ELECTIVES	4 – 6 CH
		23 – 24 CH
	Total credit hours at 400 level	42 – 45 CH

## ELECTIVE COURSES

### 2ND

#### SEMESTER

Select two to three (2-3) courses from the list

ACH453	COLOUR CHEMISTRY & TECHNOLOGY II	2
CHM411	CHEMISTRY OF LANTHANIDES AND ACTINIDES	2
CHM414	ORGANOMETALLIC CHEMISTRY II	2
CHM416	SOLID STATE & STRUCTURAL CHEMISTRY	2
CHM428	NANOCHEMISTRY AND NANOTECHNOLOGY	2
CHM432	ORGANIC SYNTHESIS	2

Project starts from 1st Semester and is completed and examined at the end of the 2nd semester.

### 5.3 COURSE DESCRIPTION FOR B.Sc. APPLIED CHEMISTRY CHM101 GENERAL CHEMISTRY I 3 CH (1<sup>st</sup> semester)

*(Offered to College of Medical Sciences, Faculty of Science except Chemistry students, Faculty of Agriculture, Faculty of Education except Education Chemistry students)*

Atoms, molecules and chemical reactions, atomic structure, modern electronic theory of atoms, properties of gases, chemical equilibria, thermochemistry and thermodynamics, chemical kinetics, electrochemistry.

#### CHM111 FOUNDATIONAL CHEMISTRY 3 CH (1<sup>st</sup> semester)

*(Offered to B.Sc. Chemistry, B.Sc. Applied Chemistry, B.Sc. Marine Chemistry and B.Sc. (Ed.) Chemistry students)*

Significant figures, scientific notation and units, stoichiometry, atomic structure, modern electronic theory of atoms, gas laws and molecular theory of gases, ionic equilibria, chemical equilibria, thermochemistry and thermodynamics, chemical kinetics, introduction to electrochemistry.

#### CHM 102 GENERAL CHEMISTRY II 3 CH (2<sup>nd</sup> semester)

Historical survey of the development and importance of organic chemistry, nomenclature and classes of organic compounds, homologous series, functional groups, isolation and purification of organic compounds, qualitative and quantitative organic chemistry, stereochemistry, determination of structure of organic compounds, electronic theory of organic compounds, saturated hydrocarbons, unsaturated hydrocarbons, periodic table and periodicity, structure of solids, chemistry of metals and non-metals, chemical bonding, intermolecular forces, qualitative analysis, chemical equations and stoichiometry.

#### ACH 201 INTRODUCTION TO INDUSTRIAL CHEMISTRY

##### 2 CH (1<sup>st</sup> semester)

The chemical industry; Characteristics of the chemical industry; Industrial chemical processes; Dimensions and dimensionless groups for momentum, heat and mass transfers; Elementary treatment of unit operations-mixing, pumping, filtering, evaporation, distillation, absorption and adsorption. Flow diagrams and reactors.

#### ACH 211 CHEMICAL TRANSPORT PROCESSES

**2 CH (1<sup>st</sup> semester)**

Types of steady flows, Viscosity distribution in pipes, Flow measurements, Energy requirements in fluid flow, Application of the Total Energy balance equation to fluid flow systems, The total Mechanical-Energy balance equation, Friction losses, Application of the Total Mechanical-Energy equation; Fluid flow equipment-pipes, fittings values and pumps.

**CHM 211 INORGANIC CHEMISTRY I 2 CH (1<sup>st</sup> semester)**

Pre-requisite CHM 111

Chemistry of first row transition metals, introduction to co-ordination chemistry including elementary treatment of crystal field theory, elementary introduction to organometallic chemistry, role of metals in biochemical systems.

**CHM 221 PHYSICAL CHEMISTRY I 2 CH (1<sup>st</sup> semester)**

Pre-requisite CHM 111

Kinetic theory of gases, behaviour of real gases, the law of thermodynamics, entropy and free energy, basic electrochemistry. Electrochemical cells and potentials, reversible potentials, applications of reversible potentials.

**CHM 241 ANALYTICAL CHEMISTRY I 2 CH (1<sup>st</sup> semester)**

Pre-requisite CHM 111 and CHM 102

Analytical process, types of chemical analysis and steps in chemical analysis, chemical concentrations, preparation of solutions and stoichiometric calculations, safe and ethical handling of chemicals and waste, analytical balances, burettes, volumetric flask, pipette syringes, filtrations, drying and weighing, experimental errors, distributions, quality assurance and calibration methods

**ACH 212 MATERIAL, ENERGY & HEAT TRANSFER PROCESSES****2 CH (2<sup>nd</sup> semester)**

Material balance equation, Representation of material flow in a chemical process, Units of material flow and balancing, Techniques in material balancing; Energy balance, Application of energy balance, Nature of heat flow, Heat transfer by conduction, Convection, the practice of heat exchange, Heat exchangers, boiler and furnaces.

**CHM212 STRUCTURE AND BONDING 2 CH (2<sup>nd</sup> semester)**

Modern electronic theory of atom, introduction to wave mechanics derivation of Schrodinger's Wave equation, its essential features and application to the electron in hydrogen atom, ionic bonding, crystal lattices, crystal structure and lattice energy, covalent bonding, valence bond theory and molecular orbital theory, shapes of molecules, Lewis structure, resonance structure, valence shell electron pair repulsion (VSEPR) theory, forces between atoms, ions and molecules, dipole-dipole interaction, induced-dipole interaction or the London forces. Metals and metallic bonding, methods of investigating structures.

**CHM 232 ORGANIC CHEMISTRY II 2 CH (2<sup>nd</sup> semester)**

Pre-requisite CHM 102

Stereochemistry, sequence rule - R, S and E. Z notations, dynamic stereochemistry, conformational analysis, factors affecting structure and physical availability of electrons, methane, energy of activation and free radical substitution reaction of alkanes. Functional group chemistry, electrophilic and nucleophilic substitution reactions, aromaticity, addition and elimination reactions

**CHM 234 ORGANIC CHEMISTRY III 2 CH (2<sup>nd</sup> semester)**

Pre-requisite CHM 232

Preparation, properties and reactions of alcohols, phenols, ethers, epoxides and amines, carboxylic acids and their derivatives.

**CHM 242 ANALYTICAL CHEMISTRY II****2 CH (2<sup>nd</sup> semester)**

General concepts of equilibrium, acid/base equilibrium, pH scale, calculation of pH for Acids/Bases, buffer solutions, Acid/Base titrations, titration of polyprotic acids/mixture of Acids/Bases, kjeldal analysis, gravimetric analysis, unit operations in gravimetric analysis, complexation titrations, complex

formation constants, chelates (EOTA), titration curves, detection of end points (indicators), precipitation reactions and titrations, reduction/oxidation reactions and potentiometric titrations.

### **ACH 313 SEPARATION METHODS & PROCESSES**

#### **2CH (1<sup>st</sup> semester)**

Chromatographic methods, supercritical chromatography, electrophoresis, capillary zone electrophoresis, solvent extractions, counter current distribution, solid-phase extractions, solvent extraction by flow injection analysis, distillation, fractional distillation, atmospheric distillation and recrystallization. Characteristics of separation process phase equilibria separation, Distribution equilibria separation, the separation factor and its relationship to molecular properties; selection of separation process; feasibility, selectivity, separation capacity; product value. Chromatographic methods, supercritical chromatography, electrophoresis, capillary zone electrophoresis, solvent extractions, counter current distribution, solid-phase extraction, solvent extraction by flow injection analysis, distillation, fractional distillation, atmospheric distillation, and recrystallization.

### **ACH 315 PETROCHEMICAL INTERMEDIATES**

#### **2CH (1<sup>st</sup> semester)**

Petrochemical industry feed stock, chemicals from C(1) to C(4) and higher hydrocarbons, synthesis of gas chemicals, polymers from alkenes, petroleum aromatics, synthetic fibers and rubber, plastics, synthetic detergents, petroleum coke and carbon black. Sources of Petrochemical hydrocarbon-petroleum gases, liquefied petroleum gases; straight-run petroleum liquids; crackates, reformates, and hydrocrackates; Ethylene of naphtha, LNG and LPG. C4-olefins from steam-cracking of naphtha. Derivatives of paraffins-hydrogen and carbon monoxide, methanol and formaldehyde; chlorine derivatives; Derivatives of ethylene-polyethylene, linear olefins, vinylmonomers, acetaldehyde and ethanol; ethylene oxide and its derivatives; Derivatives of propylene; polypropylene, propylene oxide and its derivatives, vinyl monomers. Butadiene and its derivatives. Benzene, toluene and the xylenes (BTX) BTX from catalytic reformat; C8 aromatics separation-the xylenes and ethylbenzene; Benzene and its derivatives. Ethylbenzene and its derivatives; phenol and its derivatives; toluene and its derivatives, the xylenes and their derivatives: terephthalic acid as important monomers; paraffin wax.

### **ACH 317 PETROCHEMISTRY & GEOCHEMISTRY**

#### **2 CH (1<sup>st</sup> Semester)**

Introduction to petroleum geochemistry, petroleum system, origin of organic matter, environment of deposition of organic matter, stages of formation of petroleum, migration/accumulation of petroleum, fate of petroleum in reservoir, source rock evaluation, correlation of petroleum; petroleum in the contemporary energy scene; nature, classification and composition of crude petroleum and natural gases, distribution of petroleum and natural gas resources (the global and Nigerian situations), petroleum technology, survey of refinery products and processes, prospects for the petrochemical industry in Nigeria.

### **ACH 319 KINETIC AND INDUSTRIAL CATALYSIS**

#### **2CH (1<sup>st</sup> semester)**

Experimental data, Rate constants and reactor design; Homogeneous reactions, methods of mass transfer in chemical reaction vessels, Rate expressions, Generation and treatment of rate data; batch reactors, Flow reactors: PFR, CST; selectivity in Flow reactors. Heterogeneous reactions: Heterogeneous catalysts. Reaction rates over porous catalysts. Catalyst preparation and characterization, Catalyst evaluation program: activity and selectivity, stability and strength tests; recovery of unchanged catalyst, Catalyst markets, Catalysis by metals, semiconductors, and insulators; Catalysts for automobile emission control, coordination Catalysts and stereonegular synthesis; Enzymes; shape-selective catalysts; Catalyst of the future.

### **ACH 321 INDUSTRIAL METALLURGY 2 CH (1<sup>st</sup> semester)**

Inventory of metal ore deposits in Nigeria, Sources of metals, production of metals from ores; iron and steel production processes: The blast furnace, electric arc furnaces, basic oxygen processes. Alloys and their uses, superconductors; Non-ferrous metals.

### **ACH 351 POLYMER SCIENCE AND TECHNOLOGY I**

#### **2CH (1<sup>st</sup> semester)**

Polymer nomenclature, sources of raw materials for polymers, polymerization in details, solubility and solution properties of polymers, structure and properties of polymer, fibre forming polymers. Classification of polymers: based on polymerization mechanism; base on polymer structures; based on thermal properties-thermoplastics and thermosets; polymer structure: copolymers, tacticity, geometric isomerism; Nomenclature of polymers; molecular weight averages; chemical structure and thermal transitions: polymer synthesis: chain and step polymerizations; detailed treatment of step polymerization; polymerization techniques-bulk, solution, suspension and emulsion polymerization; polymerization in supercritical fluids.

### **ACH 353 COLOUR CHEMISTRY & TECHNOLOGY I**

#### **2CH (1<sup>st</sup> semester)**

Colour and constitution chemistry, properties of dyes and pigments, classification of dyes and fibres, dyeing mechanism, preparation and dyeing of natural and synthetic fibres, colour fastness properties, quality control procedures and colouration industry.

### **ACH 357 CARBOHYDRATE CHEMISTRY & TECHNOLOGY**

#### **2CH (1<sup>st</sup> semester)**

Classification, structure and nomenclature, Monosaccharides and Dissacharides, general reactions, preparations and reaction mechanism, configurations, epimerization, polysaccharides, derivatives of starch cellulose and starch dextrin, industrial uses of starch and cellulose.

### **ACH 359 INDUSTRIAL CHEMICAL PROCESSES I**

#### **2CH (1<sup>st</sup> semester)**

Survey of Nigeria's industry and their raw materials requirements, Mineral Chemistry; fossils and their uses, plant and animal sources of raw materials, nuclear, solar and hydrodynamic sources of energy, production of primary intermediates and synthesis of industrial organic chemicals, polymers, adhesives, dyes, explosives, insecticides, pesticides, herbicides, flavoring agents and pharmaceuticals, fermentation processes, potentials and applications of locally available raw materials as industrial feedstock.

### **CHM 311 RADIO AND NUCLEAR CHEMISTRY**

#### **2CH (1<sup>st</sup> semester)**

Natural radioactivity, fusion, decay processes, nature of radiation, nuclear models, energetics of nuclear reactions, principles and measurements of radioactivity, applications of radioactivity, radiation hazards.

### **CHM 313 INORGANIC CHEMISTRY II 2 CH (1- semester)**

#### **Pre-requisite CHM 211**

Hydrogen: electronic structure, bonding and genera, properties; Comparative chemistry of the following elements (a) Ga, In, Tl, (b) Ge, Se, Pb (c) As, Sb, Bi, (d) Se, Te, Po; Comparative study of group 1(IA) and group 2(IIA) elements; comparative chemistry of elements d-block substance, theories of coordinating bond.

### **CHM 331 FOOD CHEMISTRY 2 CH (1<sup>st</sup> semester)**

Components of food, vitamins, additives, adultrants, chemistry and microbiology of food process and control, food preservative and spoilage, processing and preservative of local food stuff, shelf life study of food, kinetic of deteronetive reactions in food.

### **CHM 315 NON-AQUEOUS SOLVENTS**

#### **2CH (1<sup>st</sup> semester)**

Classification and general characteristics, solute-solvent interaction, protonic solvents liquid halides, dinitrogen tetraoxide, sulphur dioxide.

### **CHM 390 INDUSTRIAL ATTACHMENT 2 CH (1<sup>st</sup> semester)**

Industrial Attachment is compulsory for all students in Applied Chemistry programme. Third year students are expected to proceed on a six-month attachment in any industrial establishment of their choice immediately after the second semester examinations. Prior to this, students should collect a letter of introduction from the Head of Department at the end of the first semester of 3<sup>rd</sup> year, which they should attach to their applications to the establishments they expect to serve to facilitate their consideration by the organization concerned. They should liaise with Departmental IT Coordinator for necessary guidance. Each student is expected to make a presentation on return from their IT of their activities during their attachment and to submit a written report at the end of the exercise to the coordinator through his/her Departmental supervisor.

#### **ACH 400 PRACTICAL APPLIED CHEMISTRY 2CH (1<sup>st</sup> semester)**

Extraction of Natural dyes and dyeing of fabrics synthesis of dyes via diazotization and dyeing of cotton fabrics, Production of pomades, soap, detergent and bleach; determination of acid, free fatty acid and saponification values of fats and oil, preparation of lime from limestone. Any other experiments are subject to availability of raw materials and equipments. Preparation of urea-formaldehyde and phenol-formaldehyde resins and their adhesive and plastic properties, step and chain polymerizations, metallic soap driers, emulsion and oil paints; tensile strength, creep flow and related properties of plastics, identification of plastics; inks, insecticides and herbicides, biodiesel other experiments are dependent on availability of materials and equipments.

#### **ACH 414 PROCESS CONTROL AND DEVELOPMENT 2 CH (1<sup>st</sup> semester)**

Automation of -a process; instruments used to achieve control: Temperature measurement, flow measurement, pressure measurement, liquid level measurement; The controller: on-off control; proportional control, Rate control, the control value; Computer control. Developing the process: Envisioning the process, verifying the reaction, studying the reaction, defining the process, screening variables, optimizing condition; rate of the reaction and reactor design. A case study of urea synthesis.

#### **ACH 416 ENVIRONMENTAL CHEMISTRY 2 CH (1<sup>st</sup> semester)**

Concepts of elementary cycles, characteristics of the atmosphere. Sources, types and effects of environmental pollution. Waste water treatment, composition of domestic wastes, water chemistry and analysis, chemical and physical instrumentation in environmental sciences. Sustainability: Energy sources; wind power, wave power, solar power, photovoltaic cells, artificial photosynthesis; methane hydrate, the hydrogen economy; pollution: the ozone layer; global warning, Trace chemicals - pesticides and non-pesticide lipophiles; Air pollution: sulphur dioxide and particulates, automobile exhaust emissions; water treatment; solid wastes and their treatments; petrochemical industry waste. Green chemistry: Decline in acetylene chemistry, replacement of phosgene, nylon; liquid and supercritical carbon dioxide and water, ionic liquids, photocatalysis, genetic manipulation. Concepts of elementary cycles, characteristics of the atmosphere. Sources, types and effects of environmental pollution. Waste water treatment, composition of domestic wastes, water chemistry and analysis, chemical and physical instrumentation in environmental sciences.

#### **ACH 422 SOAPS, DETERGENTS AND COSMETICS 2 CH (1<sup>st</sup> semester)**

Saponification process, soft, liquid, hard, and metallic soaps; sources of vegetable and animal fats and oils for soap production; Detergents production process; Cationics, anionics and nonionics detergents; soap and detergents additives; Cosmetics formulation processes- c of hair and skin; Classes of Cosmetics; natural and synthesis agents used as toners in creams; shampoos.

#### **ACH 425 AGRICULTURAL & INORGANIC COMMODITY CHEMICALS 2 CH (1<sup>st</sup> semester)**

Inorganic fertilizers; organic fertilizers; soil treatment agents-classification, synthesis and functions of insecticides, herbicides selectivity; fungicides, Plant growth regulations; fumigants. Manufacture, processing and uses of bulk volume inorganic commodity chemicals sulphuric acid and its derivatives, chlorine manufacture, the Solvay process; synthesis gas processes; ammonia, the Haber-Bosch process. Derivatives of ammonia: nitric acid, ammonium nitrate, ammonium phosphate,

ammonium sulphate, potassium nitrate, urea, ethanol amines ; Lime, oxygen, titanium dioxide, carbon black, sodium tripolyphosphate, among others.

### **ACH 457 APPLIED SURFACE AND COLLOID CHEMISTRY**

#### **2CH (1<sup>st</sup> semester)**

Some general principles relating to surfaces, electrical potentials, attractive forces, solid gas interface and liquid interface, definition of colloid and history of colloid development, types of colloid, polymers, proteins, gels, association colloid, detergency.

### **CHM 417 ORGANOMETALLIC CHEMISTRY I**

#### **2CH (1<sup>st</sup> semester)**

Classification of organometallic compounds, preparation, structure and reactions including abnormal behaviour of organometallic compounds, synthetic utility of organometallics generation, detection of free radicals, organometallic compounds (main group organometallic chemistry).

### **CHM 431 ORGANIC CHEMISTRY IV**

#### **2 CH (1<sup>st</sup> semester)**

Pre-requisite CHM 331

Polynuclear aromatic hydrocarbons and alicyclic chemistry, polyfunctional compounds, heterocyclic chemistry (three-six membered ring compounds with N, O or S heteroatom).

### **CHM 433 APPLIED SPECTROSCOPY**

#### **2 CH (1<sup>st</sup> semester)**

Principle and applications of UV, IR, NMR and Mass spectroscopy to the determination and elucidation of structure of organic compounds.

### **CHM 441 INSTRUMENTAL METHODS OF ANALYSIS**

#### **2CH (1<sup>st</sup> semester)**

Absorption of electromagnetic radiation, Beers & Lambert Laws, atomic absorption spectroscopy, emission spectroscopy, magnetic resonance spectroscopy, ultraviolet-visible spectroscopy, infra-red spectroscopy, electron spin resonance spectroscopy.

### **CHM 470 SEMINAR**

#### **1 CH (1<sup>st</sup> semester)**

Students are assigned topics and supervisors at the end of the first semester of their 3<sup>rd</sup> year. The seminar consists of written Reports with substantial literature review and oral presentation. Seminar topics should have some relationships with applications. Students should consult the Departmental Seminar Coordinator for more information,

### **CHM 480 PROJECT**

#### **6 CH (1<sup>st</sup> & 2<sup>nd</sup> Semester)**

Project is a two-semester course. Students are assigned project supervisors at the end of their 3<sup>rd</sup> year. They are expected to begin their projects from the first semester of their fourth year and be examined at the end of the second semester. The project consists of extensive literature review, laboratory work, and oral examination of the finished project by an external Examiner. Project topics should be in relevant areas of Applied Chemistry.

### **ACH 413 INDUSTRIAL CHEMICAL THERMODYNAMICS**

#### **2 CH (2<sup>nd</sup> semester)**

Thermodynamics systems, system, boundary and surroundings, open system, isolated system, adiabatic system, homogeneous system, heterogeneous system; Thermodynamic equilibrium: thermal equilibrium, mechanical equilibrium chemical equilibrium; differences between thermodynamics and heat transfer; thermodynamics and industrial processes.

## **ACH 424 PHARMACEUTICALS AND SPECIALTY CHEMICALS**

2 CH (2<sup>nd</sup> semester)

The Nigerian Pharmaceutical industry, manufacturers of Pharmaceutical, Nomenclature of Pharmaceutical compounds; factors affecting degradation and expiration date of pharmaceuticals. Structures, synthesis and properties of selected pharmaceutical compounds: analgesics, Anti-inflammatory agents, psychotropics, anticonfulsants, hypnotics, (3-lactam antibiotics, antimalarials, pndrogens, estrogens, cortisone and its derivatives; The Nigeria herbal industry. Disinfectants and antiseptics-phenol and its derivatives; specialty chemicals-essential oils, flavourings agents and enhancers.

## **ACH 451 POLYMER SCIENCE AND TECHNOLOGY II**

2 CH (2<sup>nd</sup> semester)

Polymerization mechanisms, detailed treatment of addition polymerization, stereospecific ploymerization, copolymerization, phase system for polymerization industrially important thermoplastic and thermosetting polymers, polyurethanes, rubber elasticity, mechanical properties of polymers, analysis and testing of polymers, degradation of polymers. Polymerization of vinyl monomers, Free radical Polymerization and Copolymerization; ionic Polymerization and Copolymerization; Coordination Polymerization: Ziegler-Natta, matallocene Catalysts; for stereo-selective Polymerization; Living Polymers; Dendrimers; Chemical Modification of Polymers and polymer derivatives. Polymer additives, solutions, and degradation Biopolymers.

## **ACH 453 COLOUR CHEMISTRY AND TECHNOLOGY II**

2 CH (2<sup>nd</sup> semester)

The chemistry and Theory of dyeing. Chemistry and application of reactive dyes. Preparation and dyeing of man-made fibers. Dyeing machineries, printing, colouring matters for food drugs and cosmetics. Dyes used in paper industry and colour photography.

## **ACH 454 POLYMER SCIENCE & TECHNOLOGY III**

2 CH (2<sup>nd</sup> semester)

Components of Plastics; Advantages of plastics over iron and steel, glass and clay; high volume uses of plastics- automobile, aerospace, packaging, household, electronics, foodwares, watercrafts and health-care construction, sector production of plastics polyethylenes, polypropylene, polyvinyl chloride, polystyrene and copolymers, polyacatal; urea formaldehyde, epoxys phynol-formaldehyde, melarnine formaldehyde, polyurethanes, polyesters. Mechanical properties of plastics, identification of plastics, moulding of plastics -injection, extrusion, compression, casting, dip coating, blow moulding, fibres, sources of fibers, major classes of fibers calculation, wool istactic potypropylene, polyesfers, polyamides (nylons), polyacrylonitrile, polyurethanes, chemical modification of wool and catton, the spinneret and yarn production; and products of fibres; carbon fibres. Elastomers; diene elastomers: Polyisoprene, polychloroprene; Nondiene elastomers: polyisobutylene, polysiloxanes, polyurepanes; BBS, SBr; fluoroelastomers; vulcanization. Surface coatings: Binders pigments extenders, and solvents; emulsion paints; paints additives- aikyd resins, drivers. Adhesive, natural and synthetic adhesives; thermoplastic adhesives; thermoset adhesives, specialty adhesives

## **ACH 455 FATS, OILS, LUBRICANTS & GREASES**

2 CH (2<sup>nd</sup> semester)

Sources of fats and oils, physical and chemical properties of fats and oils, waxes, analysis of fats and oils, quality control, industrial uses of fats and oils, the vegetable oils and margarine industries, the paint industry, the cosmetic industry, soaps and detergents, fats and oil as sources of organic chemical intermediates. Sources of fats and oils, physical and chemical properties of fats and oils; Waxes; Quality and industrial parameters of fats and oils; Industrial Applications of fats and oils: The vegetable oils and margarine industries; Surface coatings cosmetics; soaps and detergents. Fats and oils as sources of organic chemical intermediates. Lubricating oil properties; theory of lubrication; viscosity index improvers, pour point depressant, detergent-dispersants, lubrication improvers, anti-foam agents, oxidation inhibitors; synthetic lubricants. Classification of greases, components of grease, characteristic properties of grease and their measurements; fundamentals of grease manufacture; current trends in lubrication greases.

### **CHM 414 ORGANOMETALLIC CHEMISTRY II**

#### **2 CH (2<sup>nd</sup> semester)**

Introduction to organometallic compounds of the transition elements, classification of ligands, electron rule, bonding, preparation of organo-transition metal compounds, reactions and structures of organometallic compounds of transition elements, the chemistry of ferrocene and related compounds, the role of organometallic compounds in some catalytic reactions.

### **CHM 416 SOLID STATE & STRUCTURAL CHEMISTRY**

#### **2 CH (2<sup>nd</sup> semester)**

Classification of solids, preparation methods, characterization of solids, structure of solids phase transition, defects in solids and non-stoichiometry, diffusion in solids, structure-property correlation, magnetic and electrical properties, dielectric properties, superconductivity, ionic conductivity, reactivity of solids.

### **CHM 428 NANOCHEMISTRY & NANOTECHNOLOGY**

Basic definition of nanochemistry and nanotechnology materials behaviour at dimension, methods of preparing nano-scale materials and the design, fabrication and testing of nano-devices. Emphasis in this subject in nanoscience and how the basic studies in chemistry, physics and materials provide the basics for understanding the current research in nanotechnology.

### **CHM432 ORGANIC SYNTHESIS**

#### **2 CH (2<sup>nd</sup> semester)**

Pre-requisite CHM 331 and CHM 431

Critical review of important reaction reagents, methods including the mechanisms, applications in the synthesis of important and complex organic compounds.

### **CHM 442 ANALYTICAL CHEMISTRY III**

#### **2 CH (2<sup>nd</sup> semester)**

Electrogravimetry, polarometry and voltametric methods, coulometry, coulometric titration, potentiometric titration, thermogravimetry, differential thermal analysis, differential scanning calorimetry, Neutron Activation Analysis (NAA), isotope dilution analysis, radiometric titration, refractometry and interferometry, polarimetry, molecular fluorescence.

## **6.0 ACADEMIC REGULATIONS**

### **6.1 ADMISSION REQUIREMENTS**

There are three modes of admission into the undergraduate degree programme of the department.

- Direct entry:** A candidate can enter into our three-year degree programme by direct entry. The minimum direct entry requirements are passes in at least two of the following subjects at Advance level or its equivalent: Chemistry, Physics, English Language and Mathematics in addition to SSCE/GCE O/L pass at credit level in Chemistry, English Language, Mathematics and any other two science subjects.
- UTME:** The UTME candidates are admitted into our four-year degree programme. The UTME entry requirement are passes in SSCE/GCE/O/L in five subjects at credit level which should include Chemistry, English Language, Mathematics, Physics and Biology.
- Pre-degree:** The third mode of admission is through the degree programme. Candidates who have successful through the University of Calabar Pre-degree Science Programme may also be admitted into the Department in addition, qualified pre-degree candidates must have SSCE/GCE/O/L in five subjects at credit level which should include Chemistry, English Language, Mathematics Physics and Biology.

### **6.2 COURSE SYSTEM**

The Department operates a course system on semester basis. Each semester normally last for about 18 weeks. The different courses are weighed according to their credit hours. A credit hour may be regarded



as a series of one-hour lectures or three-hour practical classes a week for a period of semester or an equivalent of this amount of contact hour. The courses are divided into compulsory courses and electives. The compulsory courses are those which every student must take before graduation. The electives are optional courses which the candidate may take on the advice of the class adviser/Head of Department.

There is no provision for repeating a particular year of study in the course system. A student is therefore allowed to repeat only the failed courses. The maximum period allowed for the three and four year degree programme is five and six years respectively.

### **6.3 REGISTRATION**

A student shall be required at the beginning of each semester to register for all the courses, which he intends to offer during the semester. A student may be considered to be duly registered if he submits his registration card to the Department and Faculty within the stipulated period for registration. Note that a student is only duly registered for a Chemistry course upon the submission of the class admit card to the course lecturer/coordinator. The maximum academic load allowed per semester is 24 credit hours.

A student should register for all repeat courses (i.e. previously failed courses) and carry-over courses before registering for new courses for the semester subject to a maximum 24 credit hours. A student is allowed only three chances to pass a particular course after which he/she carries an F grade in that course if he/she fails it the third time.

A student will be credited with any new grade earned in a repeat course provided all the previous attempts (i.e. F grades) are used in calculating the cumulative grade point average (CGPA)

### **6.4 CONDUCT OF EXAMINATION**

#### **Assessment**

The assessment of students may be of two types; the continuous assessment and the conventional end of the course examination. The students may be given tests, take-home assignments or be asked to perform practicals. The scores from all these exercises are normally recorded and may constitute part of the final grade for the course. Assessment carries 30% mark.

#### **Admission to an Examination**

A student shall normally be admitted to an examination only when he/she has duly registered for the course, attended a minimum of 75% of the lectures and paid the prescribed fees. It is the responsibility of the student to ascertain the venue, date and time of an examination.

A student is expected to come to the examination hall with his/her own writing materials except the answer booklet or sheet which should be provided by the Department at the examination venue. There will be no borrowing or exchange of calculators or any other materials during an examination.

A student shall be admitted into the examination hall up to 30 minutes after the start of the examination but he/she shall not be granted extra time. If a student arrives at the examination venue later than 30 minutes after the start of the examination, the invigilator may at his discretion admit him/her into the examination hall if satisfied that the student has a good reason for his/her lateness.

The invigilator shall present a written report of the circumstances to the chief examiner (i.e. the Head of Department) through the examination officer who shall inform the Departmental **Board of Examiners**, which shall decide whether to accept or reject the student's script.

#### **Conduct During an Examination**

It is mandatory that every student produces his/her identity card and unmutated fee clearance card on entry to the examination hall. These should be prominently displayed on the desk/table throughout the examination for inspection by the invigilator. Each student is expected to sign the attendance register, as evidence of participation in the examination, before leaving the examination hall.

A student can only leave the examination hall during the course of an examination with the permission of the invigilator. Any student who leaves the examination hall without permission shall not be re-admitted into the hall. The invigilator is expected to make a written report on such a candidate. No

student shall be allowed to leave the examination hall within the first hour of an examination except in cases of emergency.

Noise making is prohibited in the examination hall. No student shall therefore make any type of noise or cause any disturbance during an examination. No student shall communicate with any other student or commit any form of misconduct. All bags, textbooks, notebooks etc. should not be brought into the examination hall. Examination carries 70% mark.

## **6.5 EXAMINATION MISCONDUCT**

There are different forms of examination misconduct. These can be categorized into two main groups.

### **Category A: Misconduct Involving Students**

- a) Copying from another student or a student permitting some other person(s) to copy his/her work.
- b) Copying from another student without his/her knowledge.
- c) Coming into the examination hall with notebooks, textbooks etc. or being in possession of such materials in the hall while the examination is in progress.
- d) Impersonation or use of 'mercenary' for examinations.
- e) Smuggling question paper(s) and/or answers booklets/sheets out of or into the examination hall.
- f) Preparation and use of extraneous materials.
- g) Coming into the examination hall with write ups on any part of the body, money, dresses or other materials,
- h) Reading of notebooks/handouts/textbooks etc. outside the venue and during the examination (on the pretext of going to the toilet),
- i) Evidence of pre-knowledge of examination question or purchasing of examination question paper(s).
- j) Failure to submit answer script after the examination
- k) Causing any sort of disturbance during the examination.
- i) Plagiarism

### **Category B: Misconduct involving staff**

- a) Direct or indirect leakage of examination question to students.
- b) Helping students to answer questions during an examination.
- c) Change of marks by a course lecturer in order to pass or victimize a student.
- d) Allowing or aiding a student to substitute freshly prepared answer scripts for the ones used during an examination.
- e) Conscious alteration of grades/raw scores by an examination officer, typist, Head of Department etc. in order to "help" or victimize a student.
- f) Initiating or requesting for correction of an approved result/grade based on false claims.
- g) Withholding or destruction of script or grade in order to enable a student qualify for a supplementary (special) examination.
- h) Writing of a thesis or project report for a student by an academic staff.
- i) Lecturers aiding and abetting plagiarism.

Any form of examination misconduct should be reported immediately in writing to the Head of Department (through the examination officer) for necessary action. It is also necessary for an invigilator to collect a written statement from any student involved in an examination misconduct before he/she leaves the hall.

Examination misconduct is a very serious offence and a student found guilty of the offence may be expelled from the University. Students are therefore advised in their own interest to attend their lectures regularly and work hard for their examination in order to avoid the temptation of involving in an examination misconduct. Any case of examination misconduct is reported in writing by the invigilator or coordinator by completing an Examination Misconduct Reporting Form. The form, the student's examination script and exhibit(s) are then handed over to the Head of the Department for onward forwarding to the Senate Examination Misconduct Committee. The committee investigates the examination misconduct cases and reports to the Senate, which takes the final decision and pronounces the punishment for those found guilty of the offence.

Although sexual harassment is not synonymous with examination misconduct, both of them commonly take place simultaneously. This is because the harassment may lead to biased assessment of student's scripts in an attempt to give an undue favour or victimize the student. The University views this issue very seriously and has in very recent past set up a "Sexual Harassment Committee" to handle all reported cases of sexual harassment on campus. Students should know that they have a right to say No and should report such cases to the University authority. On the other hand students should also not harass their lecturers sexually.

## 7.0 EXAMINATION RESULTS

Examination results are published after each semester as soon as they are approved by the Senate. It is only the University Senate that has the power to approve results. The Vice-Chancellor can however, as the Chairman of the Senate, give executive approval on behalf of the Senate if such result has been recommended by both the Department and Faculty. Such an executively approved result still has to be presented by the Vice-Chancellor to the Senate for ratification. Only approved results are published.

### 7.1 GRADING SYSTEM

The following grading system is in operation;

Mark	Letter grade	Grade point	Description
70 – 100%	A	5.00	Excellent
60 – 69%	B	4.00	Very good
59 – 59%	C	3.00	Good
45 – 49%	D	2.00	Pass
40 – 44%	E	1.00	Fair
0 – 39%	F	0.00	Fail

A student shall pass an examination if he/she scores a grade of E (1.00 point) or above. A student who absents himself/herself from an examination for a course which he has dully registered without a reason acceptable to the Senate should earn an "F" grade for the examination.

### Grading system with effect from 2017/2018 academic session

Mark	Letter grade	Grade point	Description
70 – 100%	A	3.4 – 4.00	Excellent
60 – 69%	B	3.00 – 3.49	Very good
59 – 59%	C	2.00 – 2.99	Good
45 – 49%	D	1.00 – 1.99	Pass
40 – 44%	E	0.00	Fail

A student shall pass an examination if he/she scores a grade of D (1.00 point) or above. A student who absents himself/herself from an examination for a course which he has dully registered without a reason acceptable to the Senate should earn an "F" grade for the examination.

### 7.2 SUPPLEMENTARY EXAMINATION

A supplementary examination can only be granted by the University Senate if a candidate misses an examination for a reason acceptable to the Senate. The main reason acceptable to the Senate is very serious sickness. This has to be reported immediately by writing to the Vice-Chancellor/Chairman of Senate through the Dean and through the Head of Department and must be supported with a medical report. It is expected that students on campus, should report to the University Health Centre for treatment. The medical report should therefore normally originate from the Health Centre. However, for some special and emergency cases, medical report from outside the University Health Centre may be submitted. In such a case the student has to report the case to the Director of University Health Services who will review the case. The Director may endorse the medical report if convinced of its authenticity. Any outside medical report not endorsed by the Director of the University Health Services will not be accepted by the Senate.

The supplementary examination, unless otherwise ruled by the Senate, will take place during the next available opportunity. This means that a student who has a supplementary examination say in CHM

102 during the 2012/2013 academic year will take it during the second semester examination of 2013/2014 session.

### 7.3 GRADE POINT AVERAGE

The overall academic performance of a student in a particular academic year is reported in Grade Point Average, GPA. This is a weighted average of all the courses offered during the session. This is obtained by multiplying the grade point earned in each course by the number of credit hours assigned to the course. Summation of these dividing by the total credit hours taken during the session gives the grade point average. The GPA is usually corrected to two decimal places.

$$\text{GPA} = \frac{\text{Total Grade Point}}{\text{Total Credit hours}}$$

Course no.	Credit hours	Grade	Grade point
CHM 111	3	B	4 x 3 = 12
BIO 111	3	C	3 x 3 = 9
MTH 111	3	C	3 x 3 = 9
PHY 101	2	D	2 x 2 = 4
GSS 101	2	A	5 x 2 = 10
GSS 131	2	B	4 x 2 = 8
CHM 102	3	A	5 x 3 = 15
BIO 112	3	B	4 x 3 = 12
MTH 132	3	B	4 x 3 = 12
PHY 102	2	A	5 x 2 = 10
GSS 102	2	B	4 x 2 = 8
GSS 112	2	B	4 x 2 = 8
GSS 122	2	C	3 x 2 = 6
<b>TOTAL</b>	<b>32</b>		<b>123</b>

$$\text{GPA} = \frac{123}{32} = 3.84$$

### CUMULATIVE GRADE POINT AVERAGE, CGPA

GPA is the weighed up-to-date Grade Point Average earned by a student. CGPA is not a mean of the GPA earned at different levels of study. The CGPA is the total Grade Point earned from the beginning of the programme divided by the total credit hours.

### 7.4 PROBATION AND WITHDRAWAL FROM PROGRAMME

Senate at its 192<sup>nd</sup> meeting held on 14<sup>th</sup> August, 2012, decided as follows:

- That any student who fails 12 credit units of course work with CGPA of more than 1.50 should go on probation.
- That any student who fails 15 credit units of course work with CGPA of less than 1.50 should withdraw from the programme.

Accordingly, probation is a status granted to a student who fails twelve (12) credit units of course work with GPA of more than 1.50 at the end of any session. The probation year enables him/her repeat all the failed courses and hence improve on his/her CGPA. Since repeating a previously passed course is not permitted, a student on probation should therefore not register for any new course. At the end of the probation year, the student will be credited with all the new grades as well as all the previously earned grades (both the pass grades and F grades).

Any student whose CGPA is up to 1.50 at the end of a particular probation year is allowed to proceed with his/her normal studies provided the said student does not have more than 12 credit units of failed course work. On the other hand any student whose CGPA falls below 1.50 at the end of the probation year will be asked to withdraw from the University if he/she is unable to be absorbed into another programme. Any student with CGPA below 1.50 with 15 credit units failed course work, at the end of any session should withdraw from the programme.

### 7.5 GRADUATION REQUIREMENTS

- Minimum number of credit units required before graduation - 136

- b) Minimum number of years before graduation - 4 years
- c) Minimum CGPA for graduation -1.50

**7.6 REMARKING OF SCRIPTS**

A student shall have the right to call for reassessment of his/her script if he/she has sufficient cause to believe that he/she was not properly assessed. The request for remarking must be in writing and should be directed to the Registrar with evidence of payment of the prescribed reassessment fee to the University. The student should not know who the assessors are. The script to be re-assessed is usually mixed with other scripts in order to avoid biased assessment. At the end of the assessment, any change in the petitioner's script would be effected while the accompanying scripts would retain their original grades.

**7.7 SUSPENSION OF STUDIES**

A student may be granted suspension of studies for a period not exceeding two years by the Senate. Request for suspension of studies must be in writing to the Senate through the Head of Department, through the Dean of Faculty.

**7.8 CLASSIFICATION OF DEGREE**

The degree is classified as follows based on the Cumulative Grade Point Average, CGPA. This is to come into effect in the 2013/2014 academic session.

<b>CGPA</b>	<b>Class of Degree</b>
4.50 – 5.00	First Class (Honors)
3.50 – 4.49	2 <sup>nd</sup> Class (Hons) Upper division
2.40 – 3.49	2 <sup>nd</sup> Class (Hons) lower division
1.50 – 2.39	3 <sup>rd</sup> Class (Hons)
Below 1.50	Fail

## **8 0 DEPARTMENTAL RESPONSIBILITIES**

### **8.1 EXAMINATION OFFICER**

The Examination officer is usually an Academic Staff not below the rank of Lecturer I. The Department nominates the candidate for the Vice-Chancellors approval. The Examination Officer is directly responsible to the Head of Department, acting as the Departmental Chief Examiner.

The duties of the examination officer include:-

- a) Making adequate arrangement for invigilation
- b) Making physical adequate arrangement for the examination
- c) Preparation of result sheets for duly registered students of the Department
- d) Any other duties as may be directed by the Head of Department or the Departmental Board of Examiners.

### **8.2 ACADEMIC ADVISER**

Students at each level of study are assigned at least one (1) Academic Staff as Academic Adviser. It is the duty of the Adviser to:

- Assists students with course registration, i.e. provides guidance in course selection in keeping with students' interests, values and abilities.
- Advises them on academic, career and personal issues, identifies the educational and career options appropriate for each student and assists with the analysis of each option, including possible outcomes and their implications.
- Monitors academic progress of students, determines eligibility and satisfactory progress towards degree, identifies current and potential needs or problem area (e.g. study skills, tutoring) and proffering solutions.
- Interprets and explains university policies and procedures, participates in preparation of orientation and presents academic information to new students.

The students are therefore advised to avail themselves of this opportunity to improve their academic performance.